



FRD ACTIVITIES REPORT

April - June 2011



RESEARCH PROGRAMS

NOAA Support for Japanese Earthquake

In April ARL provided dispersion modeling support to NOAA as part of its response to the Fukushima nuclear crisis in Japan. Steve Fine, acting DAA for Planning and Administration, coordinated the overall OAR response to the crisis. ARL Headquarters (Roland Draxler and Yunsoo Choi) and FRD (Rick Eckman) collaborated in running a series of HYSPLIT model runs to estimate atmospheric radiological doses and deposition from the power plant. One of the major uncertainties was the total emissions of important radionuclides during the event. Some emission scenarios had over one hundred times as much cesium 137 being released as others. Aircraft observations downwind of the plant were used to narrow the modeling to the most plausible scenarios. The HYSPLIT output was coupled with an ocean model to estimate possible oceanic impacts of the radiation.

NOAA/DOE Wind Forecast Improvement Project

Preparations are in progress for the Wind Forecast Improvement Project (WFIP) now slated to begin July 18 (originally July 1). Kirk Clawson, Tom Strong, Shane Beard, and Dennis Finn will leave Idaho Falls on July 6 ahead of the project starting date and travel to the study area in Texas for deployment at the Jayton, Colorado City, and Brady sites over the next 10 days. Roger Carter and Brad Reese will provide support from Idaho Falls and confirmation that communications have been successfully established. The Texas deployments will be for a full year with each site visited about every 6-7 weeks.

FRD will deploy a radar wind profiler, a fully instrumented meteorological tower, a minisodar, and a sonic anemometer at the Brady site. A minisodar and sonic anemometer will be deployed at the Colorado City site and FRD will also support the communications for a radar wind profiler provided by STI. FRD will deploy a minisodar and sonic anemometer near an existing permanent NOAA radar profiler installation at the Jayton site.

The new ASC minisodar and an upgrade of an old ASC minisodar were delivered in early June. The upgrade makes the older unit essentially identical to the new ASC 4000. FRD has been conducting tests of these units and becoming familiar with their operation during the month of June. An evaluation of data from the ASC 4000 upgrade indicates that the wind speed bias problem, mentioned in the last quarterly report, was resolved by the upgrade. The new ART VT-1 minisodar was delivered on June 24 and FRD staff received training in operations and maintenance the last week of June.

Much of the preparatory work has involved configuring the communications and data acquisition procedures that will be used in Texas. These have been successfully configured and tested for the ASC and ART minisodars, sonic anemometers, and radar profiler. Other preparatory work included getting

the towers ready and building an environmental housing for the radar profiler computer.
(Dennis.Finn@noaa.gov)

HRRR Collaboration with ESRL

FRD continues to collect the output from the 3 km High Resolution Rapid Refresh (HRRR) model and compare it both with observations from the FRD tower network in Idaho and with local numerical forecasts using the Weather Research & Forecast (WRF) model operated at FRD. HRRR underestimates the observed wind speeds by about 30% on average. There is preliminary evidence that this speed bias may have been reduced some when the HRRR model started being initialized by the Rapid Refresh (RR) model rather than the Rapid Update Cycle (RUC). Further improvement may have resulted from a more recent shift in the way near-surface observations are assimilated into the RR model. During this summer, HRRR appears to have a tendency to initiate convection over nearby mountains in Southeast Idaho more frequently than is observed.

Cheaperclipper/WHISSP

FRD has developed a preliminary conceptual design of a very lightweight and inexpensive transponder that could be used as a small balloon payload such as the WHISSP balloon. Because of the small size and weight it could also be used as a payload on a small blimp, UAV or tetheroon. For quantities of 10, the transponder cost is \$394 each including assembly.

Because of the very powerful and feature rich microcontroller targeted for this design, most added functionality should not change the cost of transponder (unless sensors are added). The Iridium satellite system was also selected to provide communications with the transponder. Our experience over the years has also shown that the Iridium satellite system covers the whole earth from pole to pole with excellent reliability. In addition, there is no need to get permission when the transponder location moves from satellite to satellite as is required when the military satellite network is used.

In an effort to keep costs low, the proposed initial transponder performs some basic measurements and returns these data via the Iridium satellite system. Below is a basic list of data that will be gathered and transmitted back to the ground receiver.

1. Transponder Number
2. Year, Month, Day, HH:MM:SS
3. Battery voltage
4. Latitude, longitude, and altitude from the GPS unit
5. Very accurately digital barometric pressure
6. Very accurate digital air temperature and relative humidity

The transponder will also be able to measure two additional analog inputs and additional digital sensors but it will not be initially configured into the system hardware and software. There are a number of complicated issues involved in doing so. At this juncture we only want to demonstrate a basic unit built as inexpensively as possible so that we can test how well it works with just a few sensors. After initial testing, we will know better what would be involved in adding added functionality.

In the future it may be desirable to consider cut-down polygons or radii along with a timeout cut-down. The selected microprocessor is very capable of this function and it would be only a matter of the software design to do this.

U.S. Historical Climate Network–Modernization

FRD continues to maintain the plotting programs and web page used in the daily and monthly quality control of the U.S. Historical Climate Network-Modernization network. (Jason.rich@noaa.gov)

Tracer Sampler New Tubing Tests

Tests of possible candidates to replace the latex tubing used on the tracer sampler boxes continued during the quarter. Testing for the possibility that some of the tracer gas might adsorb to the walls of the tubing and subsequently contaminate samples in the bag was completed. The results of this testing indicated that latex and Tygoprene were associated with significantly larger contamination artifacts than R-1000 and R-3603 tubing. This was especially true for the three PFC tracers. SF6 also exhibited a slight tendency toward more contamination from the latex and Tygoprene tubing although it was generally negligible in all cases. Sample retention (aging) tests are still in progress. To date, all of the tubing candidates have shown excellent sample retention for SF6. It is still preliminary but some data suggests the possibility of retention problems for the PFC tracers for R-1000 and R-3603 tubing.

Tracer Dispersion Proposals

All of the four tracer research proposals submitted early in the last quarter were rejected. In the end, funding for these was cancelled and there were no awards given to proposals from any group.

A new, minor tracer research opportunity involving dust transport research was identified in early May. A proposal was developed for this project and it was approved in mid-June. The dust research project is being conducted by the Pacific Northwest National Laboratory, Desert Research Institute, and the University of Utah on the Hanford Reservation in central Washington. They required tracer measurements to provide a control on the dust measurements being made. The SF6 tracer was injected into the road dust plume being generated at wheel level by a vehicle traveling a dirt road. The intent is to provide a simultaneous line source for dust and the tracer. Collocated dust and tracer measurements were then made at stations downwind of the road. Fast response, real-time tracer measurements are required so the tracer gas analyzers (TGAs) were used in this deployment.

The first phase of study was conducted 13-15 June. During the three days of testing, optimal tracer release rates were determined, improvements in the siting of the TGAs were made, and a possible defect in the tracer release mechanism was identified that could potentially result in either post-release leakage and/or delay in achieving equilibrium after initiating the release on each pass along the road. A second, longer phase of work is currently planned for September. . (Dennis.Finn@noaa.gov)

High Performance Computing

A proposal from FRD to NOAA's HPCC incubator program was awarded in late June. The proposal calls for accelerating the HYSPLIT dispersion model execution times with the use of Graphical Processing Unit (GPU) computing. This work will be done in collaboration with Dr. Inanc Senocak at Boise State University, a recognized expert in the field of GPU computing who will provide much of the expertise for the project. FRD will provide project oversight as well as consultation based upon our previous work and experience with HYSPLIT. Work will begin after the necessary hardware and software have been acquired and Dr. Senocak has identified a qualified graduate student. (Dennis.Finn@noaa.gov, Rick Eckman)

NOAA/IDAHO NATIONAL LABORATORY (INL) METEOROLOGICAL RESEARCH PARTNERSHIP

Emergency Operations Center (EOC)

FRD has been working with the INL emergency planning organization to develop special data sets for use during an emergency response drill in July and the annual emergency response exercise that will take place in October. The data sets contain artificial (or “canned”) weather data for the NOAA/INL Mesoscale Meteorological Network and the nuclear radiation sensors that are co-located with some of the meteorological towers. The weather data and radiation readings are calculated to match the drill or exercise scenario. The data will be placed on the FRD server and accessed by the drill and exercise participants with the same computer application used to display the information during an actual emergency. The dispersion models used in the emergency operations center will be able to use the same information for their dose calculations. Allowing the participants to interact with the information in a very realistic way greatly enhances the value of the drill and exercise. (Roger.Carter@noaa.gov)

There were three EOC drills this quarter and NOAA participated in every one. The first drill occurred on 10 May with Team D. The scenario was a suspicious package at IORC that involved an anthrax threat. Recent reconfiguring of NOAA’s computer connections in the EOC by BEA, and unknown to NOAA, caused a complete lack of internet connectivity for the drill. The NOAA participant spent the entire drill working with BEA IT to get a resumption of the connection. Next, NOAA participated in a Team A drill on 25 May. The drill centered on a fire inside a building at the MFC facility. NOAA provided short term forecasts and ran a plume plot on the possibility that radioactive material would be released from the building. Finally, NOAA participated in a Team C drill at the EOC on 15 June. The drill centered on a spill of AMERCOR 1848 at the CFA facility. NOAA provided short term forecasts and directions of evacuation during the drill. We also ran several ALOHA plume plots of a chemical within AMERCOR called cyclo-hexylamine during the drill.

INL Hazardous Weather Alert System

A fairly active weather pattern continued through the spring with the NOAA INL Weather Center issuing 18 weather statements. Of the 18 statements, 11 were issued due to high winds and 7 were issued due to lightning. These 18 INL Weather statements were issued in lieu of or prior to statements issued by the Pocatello National Weather Service since the Pocatello National Weather Service focuses on populated areas and the criteria for warning the public is less stringent than the INL. Additional watches/warnings were issued by the Pocatello NWS since their watches/warnings supersede the NOAA INL Weather Center statements. (Jason.Rich@noaa.gov)

Transport and Dispersion Modeling

FRD has been asked to perform additional dispersion simulations for the Advanced Test Reactor at the INL. Last year FRD modeled dispersion from the reactor using data from the NOAA/INL Mesonet covering the five-year period from 2004 to 2008. Those model runs assumed the release took place at ground level. This year similar runs will be performed except the source will be from a 76 m stack rather than at the surface. (Richard.Eckman@noaa.gov)

NOAA/INL Mesoscale Meteorological Network (Mesonet)

The semiannual calibrations and preventative maintenance have been completed on all stations except the summit of Big Southern Butte (SUM). Snow has prevented access to the station. SUM maintenance

should be completed in early July. As recommended by the DMCC Assist Visit, aspirator fans, wind speed sensor bearings, and station backup batteries are being replaced preemptively and on a regular schedule, rather than waiting for a failure.

Our old GRID-3 minisodar has been refurbished by the manufacturer as part of a major hardware and software upgrade. The upgraded unit was received in late June. The upgrade makes the older unit essentially identical to the new mobile ASC 4000 that will be used in WFIP. Installation of the upgraded unit will take place in late July.

INL Climate

Work has again begun on updating the 3rd Edition of the Climatology of the Idaho National Laboratory. The climatology will include data from the NOAA INL Mesonet and CFA Thermoscreen through December 2010. The document is expected to be ready for printing in September. The last climatology was published 1989. (Jason.Rich@noaa.gov and Kirk.Clawson@noaa.gov)

INL Health and Safety Fair

On 16 June, FRD teamed up with Dan Valle with the Pocatello NWS at the annual INL health and safety fair. We talked weather safety while handing out miscellaneous NOAA brochures and posters. We were also able to meet with a number of INL personnel that we give weather information to on a daily and monthly basis. (Jason.Rich@noaa.gov)

OTHER ACTIVITIES

Papers

Finn, D., K.L. Clawson, R.G. Carter, J.D. Rich, C. Biltoft, and M. Leach (2010). Analysis of Urban Atmosphere Plume Concentration Fluctuations. *Boundary-Layer Meteorol.*, 136:431-456 (doi:10.1007/s10546-010-9510-3)

Safety

At the April staff meeting employees viewed the video “Eye Protection” by Westcott Communications.

Evacuation and Shelter in Place drill was performed in May.

Jason Rich gave a safety presentation on texting and high water levels during our June staff meeting.

Training

Jason Rich, Tom Strong and Donna Davis (members of the FRD safety team) attended the Safety Fest of the Great Northwest in Pocatello on April 28. Everyone earned a certificate of completion for a 4-hour Safety Team course and 2-hour Safety Leadership course.

On June 7, Bryan Parker with FOCI Organizational Effectiveness Consultants, LLC wrapped up the second session of communication training for the office.

Dennis Finn received training in the operation of the ASC 4000 minisodar on June 1. Dennis Finn, Roger Carter, Brad Reese, Shane Beard, Tom Strong, and Jason Rich received training in the operation and maintenance of the ART VT-1 minisodar in late June.

Travel

May 1 Kirk Clawson and Rick Eckman attended a Department of Energy Meteorological Coordinating Council meeting Charleston, SC.

Kirk Clawson, Rick Eckman, Brad Reese, Roger Carter, Dennis Finn, and Randy Johnson traveled to Silver Spring, MD, May 2–5 to attend the ARL Review.

Dennis Finn traveled to Santa Clarita, CA May 31-June 2 to pick up the new ASC 4000 minisodar and a upgraded ASC 4000 minisodar and receive training in their operation.

Dennis Finn traveled to Richland, WA and the Hanford Reservation June 12-16 in support of a dust transport research study in collaboration with the Pacific Northwest National Laboratory, Desert Research Institute, and the University of Utah.

Rick Eckman traveled to Arlington, VA June 23-24 to attend a meeting on meteorological and oceanographic information required for offshore renewable energy, specifically wind energy and marine hydrokinetic (MHK) technologies. The meeting was sponsored by the Departments of Energy and Interior, NOAA, and the National Science Foundation. A common theme among all the subgroups at the meeting was the lack of relevant data both for resource development and model evaluation.

ARL Laboratory Review

Kirk Clawson, Rick Eckman, Brad Reese, Roger Carter, Dennis Finn, and Randy Johnson attend the ARL Review in Silver Spring, MD, held 3-5 May. They gave oral presentations, presented posters, and gave hardware/software demonstrations.

Outreach

For several years Rick Eckman has been on the committee of a Ph.D. student in the Atmospheric Sciences Department at the University of Wyoming. On 25 May the student passed his thesis defense. The topic of the thesis is convergence zones that form in the Snake River Plain in Idaho. A final version of the thesis is expected late in the summer.

Misc.

The office, once again won the “All-for-One” CFC award for Idaho agencies in the “Small Agency” (20-49 employees) size category.